

# The Incompatibility of Underspecification and Markedness in Optimality Theory\*

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Underspecification in the underlying representation cannot give rise to marked structure on the surface, because Optimality Theory grammars force an output to be equally or less marked than the input. Underspecification can still account for alternations involving unmarked structure, but it is only useful when such alternations exist along with forms that do not alternate. The evidence for the existence of such grammatical systems is not very convincing, casting doubts about the usefulness of underspecification in general.

## 1 Introduction

In this paper I argue that underspecification is not an adequate tool for explaining alternating forms within Optimality Theory. An underspecified underlying representation cannot give rise to a marked structure in the output, so alternations between marked and unmarked structure must have the marked structure specified in the input. What remains is alternations between two structures that are least marked in their respective environments; such alternations will result from either underlying specification, so again there is no need to assume underspecification. A third, underspecified specification is justified only if a language has forms that alternate between two least marked structures alongside forms that retain a constant feature specification; in this case faithfulness to the underlying feature values will give rise to the non-alternating forms, while an underspecified value will result in an alternation between the two unmarked forms.

The paper is organized as follows: in section 2 I show how the decline in markedness forced by Markedness/Faithfulness OT excludes underspecification as a tool for explaining alternations of marked and unmarked structure. Section 3 examines a case of an alternation between least marked forms, while section 4 looks at a proposal to account for marked alternations through underspecification. Finally, section 5 explores the possibility of an alternation of the last kind—one where a least marked alternation may exist together with non-alternating forms.

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## 2 Markedness

Optimality Theory is a theory of markedness. Moreton (1996) shows that, given some common assumptions about Optimality Theory, an output must either be identical to the input or less marked than the input. The assumptions necessary to derive this result are:

**Homogeneity:** The set of inputs is the same as the set of possible outputs.

**Inclusivity:** The candidate set for an input *a* always includes *a* itself.

**Conservativity:** Every constraint is either a *markedness* constraint or a *faithfulness* constraint, where:

A *markedness constraint* is one that evaluates output forms regardless of the input,

A *faithfulness constraint* is one that assigns no violation marks to the input form.

In such system an output cannot be more marked than the input because the candidate set always includes the input (*inclusivity*), which fares best on all faithfulness constraints; therefore, if the output is not identical to the input it must do better on some markedness constraint, i.e., it is less marked.

One prediction of this model is that in case an underlying form exhibits surface alternations between marked and unmarked forms, the marked form must be included in the underlying representation. In certain configurations the active constraint will be one of faithfulness so the marked form will surface, while in other configurations it will be a markedness constraint that decides in favor of the unmarked form. It will be impossible to get a form to alternate if the underlying representation is the least marked, because there will be no constraint that could derive the marked form.

On the other hand, theories of underspecification (such as Inkelas 1994) account for alternating forms by assuming that they result from an underlying representation that is neither the marked nor the unmarked form, but rather a third, underspecified value. Strictly speaking, Moreton's result does not apply to such a theory because the theory fails the homogeneity requirement: the set of inputs is *not* the same as the set of possible outputs, since the input contains feature values that can never surface. However, we can "homogenize" an underspecification theory by allowing the possibility of having underspecified feature values in output candidates, and imposing a set of undominated markedness constraints on those values that will effectively ban any such feature from surfacing in an optimal candidate. In this case faithfulness to the underlying feature value will have to be sacrificed; of the remaining candidates, markedness constraints will have to choose the least marked one. Thus, an underspecified

value cannot give rise to an alternation between marked and unmarked forms. (Proponents of underspecification theories may object to my characterization of such a system by claiming that an underspecified underlying representation should induce no faithfulness violations on any surface form; but this has exactly the same effect as forcing faithfulness violations in all forms, since what matters is that all candidates tie on the faithfulness constraints).

We have established that an underspecified input cannot give rise to an alternation between a marked and an unmarked form, rather it will always result in an output that is least marked. This output can still be an alternating one, if different feature values are the least marked in different environments. We begin by examining such a case in Yoruba.

### 3 Alternations of least marked structure: ATR harmony in Yoruba

Yoruba shows regressive spreading of the ATR feature, which is potentially structure-changing (i, e, o, u are +ATR; ɛ, a, ɔ are –ATR):

- |                |        |                     |         |
|----------------|--------|---------------------|---------|
| (1) ɔmɔ + idan | omidan | (‘child’ + ‘virgin’ | ‘Miss’) |
| ògbó + ɛni     | ògbéni | (‘old’ + ‘person’   | ‘sir’)  |

In both of the cases in (1) there is a violation of faithfulness to the ATR specification of the initial vowel. Given the assumptions of Markedness/Faithfulness OT, such a violation must have been forced by some markedness constraint. We conclude that the forms in (1) are less marked than the faithful ones, that is:

- (2) [omidan] is less marked than \*[ɔmidan], and  
[ògbéni] is less marked than \*[ògbéni].

There are two things to note about the above claim: first, it is not that there is one value of the ATR feature which is less marked than the other; rather, in each environment, a different ATR specification contributes to an overall least marked form. Second, the claim in (2) is about surface strings, and it is independent of the abstract representation of the forms and the exact formulation of the constraints. It doesn’t matter if the representation involves multiply linked segments or copying of a feature, and whether the violated faithfulness constraint is of the PARSE or the IDENT family. Regardless of those issues, we can say that there is *some* faithfulness constraint that is violated because of a dominating markedness constraint.

The issue of underspecification comes about with certain prefixes, that always inherit their ATR specification from the following root:

- (3) ẹ-rọ ('machine', from rọ 'fabricate')  
 è-rò ('a thought', from rò 'think')

Since such a prefix is always attached to a root, we have no independent evidence for an underlying ATR specification. It is here that underspecification is called for. Inkelas (1994) invokes the principle of *Lexicon Optimization* to argue that the prefix is underspecified in the lexicon: in the underlying representation, the prefix could either have [+ATR], [-ATR] or no ATR specification. Since ATR harmony is feature-changing, any of the three will work. Inkelas states that ATR harmony is a process that disconnects the initial vowel from its ATR specification and links it to the ATR specification of the following vowel. Hence, if the initial vowel has an ATR specification—any ATR specification—it will induce a PARSE violation. From the principle of Lexicon Optimization it follows that the prefix has no ATR value specified in its underlying representation.

Indeed, the underlying specification of the Yoruba prefixes is not determined by the output. But Inkelas's claim is stronger than that: for her underspecification is a specific configuration of the underlying form, and requires additional assumptions about possible underlying structure. Yoruba must have at least a two-way distinction for the ATR property, in order to distinguish, for instance, between [o] and [ɔ]; we can represent that as a feature with values specified as + or –, or as a privative feature that is either present or absent. Inkelas's system actually commits us to a three-way distinction: in addition to the two values above there is a third option, which is neither of the two. The only motivation for a third form comes from the way the grammar is set up, and it does not have any consequences on the surface form.

Underspecification theory thus introduces additional machinery that so far does not do any work. While this may seem harmless in the situation above, I claim that it is harmless precisely because it doesn't have a detectable effect: whichever option we choose, the grammar will produce the same results. In cases where a three-way contrast does have an effect, as in Turkish devoicing discussed below, it is an undesirable one. The distinction is one of markedness—in Yoruba ATR harmony, the grammar works anyway to yield the least marked form, so it is not crucial what underlying specification we choose; invoking underspecification to account for marked forms leads to problems.

#### 4 Alternations of marked structure: coda devoicing in Turkish

As a concrete case of conflict between underspecification and Markedness/Faithfulness OT we can look at the analysis of coda devoicing in Turkish. Inkelas (1994) cites Turkish coda devoicing as evidence for the necessity of allowing a three-way distinction in the grammar. Turkish has three classes of words: words whose final segment alternates between voiced and voiceless, words whose final segment is always voiceless, and words whose final segment is always voiced.

(4) <i>nominative</i>	<i>accusative</i>	
ka.nat	ka.na.dɪ	‘wing’
sa.nat	sa.na.tɪ	‘art’
e.tü.d	e.tü.dü	‘etude’

Since words behave in three different ways, Inkelas concludes there must be three different underlying specifications: a segment may be specified as voiceless, voiced, or unspecified, in which case it alternates.

Proposing these underlying forms, however, is no more than a mnemonic to distinguish the three classes of words; the explanatory force lies in the proposed grammar and what it does with these underlying representations. Inkelas does not specify the grammar for Turkish voicing alternations, but states that “Coda and onset voice specification are assigned in a purely structure-filling manner, affecting only underspecified representations” (p. 3). It seems that in order to get the alternating forms correctly, such a grammar would have to prefer a voiced obstruent over a voiceless one in a syllable onset position. What constraint could achieve this? It is not a faithfulness constraint, because the underlying form is not specified for voice. So there must be some markedness constraint that favors voicing in onset positions; faithfulness to voicing specification (either [+voice] or [-voice]) will take care of the non-alternating forms, and alternation will result for underspecified inputs because faithfulness to an underspecified feature value can not be maintained.

The above analysis makes the claim that [+voice] is the unmarked value for the voice feature in onset positions. This claim has serious consequences on the typology of voicing: one of the central assumptions of Optimality Theory is that free reranking of the constraints always yields a possible grammar. So if our markedness constraint dominated all the constraints that enforce faithfulness to voicing, we would get a language in which all onset obstruents are voiced.

We can compare this analysis of Turkish with accounts of universal voicing typology such as the one of Lombardi (1996). The voicing typology is derived through a tension between markedness of voicing and faithfulness to underlying specification of voice. Coda devoicing appears when faithfulness in

the onset—a privileged position—is stronger than markedness, but markedness is more important than overall faithfulness. It is crucial for Lombardi’s analysis that voiced obstruents are marked, not voiceless ones. Her typology predicts that no matter how the constraints are ranked, a voiceless segment should be possible in every position, and this seems to be the case across languages.

Lombardi’s voicing typology does not allow for a language like Turkish (as characterized by Inkelas), where some words display coda devoicing while others do not. A possible solution is to split Turkish into two grammars. After all, those words that preserve voicing in coda position (such as *etüd* or *katalog*) are clearly loanwords; they also display other characteristics of non-native Turkish vocabulary, such as lack of roundness harmony within the word. Such a split grammar would have faithfulness to underlying voicing specification ranked higher for loanwords than for native Turkish vocabulary (cf. Itô and Mester (1995) for a similar proposal for Japanese). Inkelas considers it a virtue of underspecification theory that it avoids splitting the Turkish lexicon into two parts that have different grammars. But such an account does away with the results of universal voicing typology—the elements used in building a grammar for Turkish under this system allow for a range of unattested grammars, which are reasonably thought to be universally impossible.

## 5 Analyzing Turkish coda devoicing as an alternation of least marked forms

An alternative suggestion by Alan Prince (personal communication) is that the Turkish alternations are indeed between least marked structures: voiced obstruents in onset position can be the result of intervocalic voicing. Under such an interpretation it will be possible to utilize a three-way distinction in the underlying forms: inputs specified for either [+voice] or [–voice] will have their underlying specification retained in the output by faithfulness constraints, while those that have the third (underspecified) value will alternate between the two unmarked values—voiced intervocalically and voiceless elsewhere. Among the typological predictions of such an account is that there should be languages where all obstruents that occur intervocalically are voiced, that is when the markedness constraint responsible for intervocalic voicing is ranked above all faithfulness constraints that pertain to voicing.

## 6 Conclusion

The last proposal shows how underspecification, that is a three-way distinction in the underlying form, can play a role in Markedness/Faithfulness OT. If a two-valued feature (whether construed as binary or privative) has different values that are the least marked in complementary environments, and if a language shows

forms that alternate between the two least marked values, then a third (neutral, underspecified) value in the underlying representation can be used to capture the alternating forms. It is important that there be non-alternating forms alongside the alternating ones, because when all the forms alternate (as in the Yoruba example from section 3) the underlying representation is indeed underdetermined, but it is not necessary to assume underspecification. Underspecification is inadequate as an account for alternations that involve marked structure, because this forces the grammar to have structural constraints that favor marked elements, leading to the undesirable prediction that there are languages in which such a structural constraint is ranked above the relevant faithfulness constraints, that is languages where all structure is marked.

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